IWC-pH™

THE PROBLEM

Most of the irrigation water in the intermountain west has an alkaline pH. Most of our soils are alkaline as well. This alkalinity in both the water and soil is generally due to the presence of calcium carbonate (free lime).

As a result of this alkaline condition in the soil, many nutrients are less available than at more neutral or acidic pH. These nutrients are phosphorus (P), iron (Fe), manganese (Mn), boron (B), copper (Cu), and zinc (Zn).

The presence of carbonates can be easily determined by dropping a few drops of hydrochloric acid (muriatic) or sulfuric acid on a spoonful of soil. Bubbling or fizzing shows that carbonates or bicarbonates are present. Generally this is calcium carbonate though there are magnesium and sodium salts present in some soils.

HISTORICAL APPROACHES

Historically growers have attempted to change the soil pH by amending the soil and/or the water. Common soil amendments are sulfur and sulfuric acid. Sulfur works by being oxidized to sulfuric acid. The sulfuric acid then reacts with the calcium carbonate to form gypsum and carbon dioxide (CO_2). Over time one can acidify a soil this way. How fast this will occur depends on the amount of calcium carbonate and sulfur, sulfur particle size, soil temperature, soil moisture, and soil aeration. For the grower that owns land this approach is an option. However, for the grower that leases different fields every year, this approach is not cost affective.

Acidification of the water can result in immediate changes, though often of short duration, in the soil water pH. Common ways of acidifying the irrigation water are to inject sulfuric or phosphoric acid. We know of cases where nitric acid and hydrochloric acid were used. There are safety hazards, both to people and equipment, associated with using any of these strong acids.

NAP'S SOLUTION

NAP has created a product that will acidify irrigation water that does not carry with it the hazards to either people or equipment that the strong acids do. This product is **IWC-pH™**.

IWC-pH™ contains organic acids that acidify the irrigation water. It also contains chemistries from the water treatment industry to help remove the carbonate build-up in the lines.

USAGE

For the best response, this product should be injected constantly into the irrigation system. The exact amount will depend on the desired end pH and the water chemistry.

We suggest that you start at a dilution rate of one gallon of IWC-pH per 10,000 gallons of water. One acre-inch of water is 27,154 gallons. Measure the pH at the point in the irrigation system that is farthest from the injection point. The pH should measure between 6.2 and 6.7. This change may take some time for the reasons outlined below.

OTHER THINGS YOU NEED TO KNOW

THE TIME LINE OF ACIDIFICATION

When you first start to use **IWC-pH™**, or any acidifier, do not expect to see any decrease in the pH of the water at the sprinkler at first. Remember that the irrigation lines are almost always lined with carbonate residues. These will need to be dissolved first. This dissolution process neutralizes the acidity in the IWC-pH™ product. The process is the same as adding vinegar to baking soda. As a result, what you will usually see is at first there is no change in the pH of the irrigation water.

Then the sprinkler nearest the injection point will show a decrease in pH. This drop in the pH of the applied water will slowly move away from the injection point until all the carbonate residue on the inside of the irrigation system is dissolved. If you could see inside the pipes you would see a band slowly moving down the pipe: the area behind it clear of carbonates and the area in front still coated with

carbonates. When this band reaches the furthest point of the system, then all of the water applied will be at the lowered pH.

If you wish to only use **IWC-pH**™ to keep your irrigation lines clean, just add this material during the last part of the irrigation system so that the acidified water reaches the furthest part of the system before shutting down the system. The combination of the acidic pH and the chemistry found in the **IWC-pH**™ will keep the calcium, magnesium, and sodium from forming insoluble salts on the inside of the lines. When the irrigation system is started again the system will be clean.

A word of warning – do not decrease the pH below pH 5.0. Very acidic pHs can damage pumps and other components of an irrigation system.

CHANGES IN SOIL pH

If your soil contains much free calcium carbonate do not expect to see a change in soil pH when you do a soil analysis. The carbonate in the soil will neutralize the acidity in the water (just as it did in the lines). However, this neutralization process usually takes several hours. During that time, when the soil solution around the roots is acidic, the nutrients that were not available because of the alkaline pH become available.

In order for the plant to get these nutrients, only a small part of the root zone needs to be acidified, not the whole thing. The plant can absorb the nutrients from one part of the root zone and translocate it to the rest of the plant.

CHANGES IN SOIL PERMEABILITY

In some cases, dependent on water and soil chemistry, the dissolution of the free calcium carbonate at the soil surface by the **IWC-pH**™ can produce an increase in soil permeability. However, this is generally short lived and will generally disappear within the irrigation year.

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